

What is claimed is:

1 1. A process for injection molding a hollow plastic article
2 comprising the steps of:
3 (a) injecting a quantity of plastic material into a mold cavity
4 to substantially fill the mold cavity;
5 (b) applying a packing pressure to the plastic in the mold
6 cavity;
7 (c) injecting pressurized gas into the plastic material in the
8 mold cavity in order to combine the application of packing pressure to the
9 plastic;
10 (d) holding the pressure of the gas and plastic in the mold
11 cavity for a predetermined amount of time; and
12 (e) allowing a portion of the plastic material in the mold to
13 be expelled into at least one secondary cavity coupled to the mold cavity by
14 opening a valve in a runner connecting the mold cavity to the secondary cavity.

1 2. The process as set forth in claim 1 further comprising the
2 steps of:
3 (f) permitting the plastic material to solidify;
4 (g) exhausting the gas from the mold cavity; and
5 (h) removing the plastic article from the mold.

1 3. The process as set forth in claim 1 wherein said plastic
2 article has at least one section which is thicker than other sections and said
3 charge of pressurized gas is introduced into the thicker section in order to form
4 a hollow portion therein.

1 4. The process as set forth in claim 1 further comprising the
2 step of applying the packing pressure to the plastic material injection pressure in
3 the mold cavity for a predetermined period of time prior to the injection of gas
4 into the plastic material.

1 5. The process as set forth in claim 1 wherein said plastic
2 material is injected into the mold cavity from an injection molding machine
3 with a barrel and nozzle, said method further comprising the step of allowing a
4 portion of the plastic material in the mold to be expelled back into the barrel of
5 the injection molding machine.

1 6. The process as set forth in claim 1 wherein portions of
2 the plastic material are expelled into at least two secondary cavities.

1 7. The process as set forth in claim 1 further calculating the
2 volume of said at least one secondary cavity in order to allow expulsion of a
3 predetermined amount of plastic material from the mold cavity.

1 8. The process as set forth in claim 1 wherein at least two
2 secondary cavities are provided and the step of allowing a portion of the plastic
3 material in the mold to be displaced into the secondary cavities comprises
4 opening valve members positioned in conduits connecting the mold cavity with
5 the secondary cavities.

1 9. The process as set forth in claim 8 further comprising the
2 step of sequentially controlling the opening of the valve members in order to
3 allow selective displacement of plastic material into the at least two secondary
4 cavities.

1 10. A process for injection molding a hollow plastic article
2 comprising the steps of:

3 (a) injecting a quantity of plastic material into a mold cavity
4 to substantially fill the mold cavity;

5 (b) applying a packing pressure to the plastic in the mold
6 cavity;

7 (c) injecting pressurized gas into the plastic material in the
8 mold cavity;

- 9 (d) holding the pressure of the gas and plastic in the mold
- 10 cavity for a predetermined amount of time;
- 11 (e) allowing a portion of the plastic material in the mold to
- 12 be expelled into at least one secondary cavity coupled to the mold cavity;
- 13 (f) permitting the plastic material to solidify;
- 14 (g) exhausting the gas from the mold cavity; and
- 15 (h) removing the plastic article from the mold.

1 11. The process as set forth in claim 10 wherein said plastic
2 article has at least one section which is thicker than other sections and said
3 charge of pressurized gas is introduced into the thicker section in order to form
4 a hollow portion therein.

1 12. The process as set forth in claim 10 further comprising
2 the step of applying the packing pressure to the plastic material injection
3 pressure in the mold cavity for a predetermined period of time prior to the
4 injection of gas into the plastic material.

1 13. The process as set forth in claim 10 wherein said plastic
2 material is injected into the mold cavity from an injection molding machine
3 with a barrel and nozzle, said method further comprising the step of allowing a
4 portion of the plastic material in the mold to be expelled back into the barrel of
5 the injection molding machine.

1 14. The process as set forth in claim 10 wherein portions of
2 the plastic material are expelled into at least two overflow cavities.

3 opening a valve member in a conduit connecting the mold cavity with the
4 secondary cavity.

1 17. A process for injection molding a hollow plastic article
2 utilizing an injection molding machine with a barrel and nozzle and a mold with
3 a mold cavity therein having a shape defining at least a portion of the article,
4 said method comprising the steps of:

5 (a) injecting a quantity of plastic material into the mold
6 cavity from the injection molding machine;

7 (b) injecting pressurized gas into the plastic material in the
8 mold cavity; and

9 (c) allowing a first portion of the plastic material in the mold
10 to be expelled back into the barrel of the injection molding machine.

1 18. The process as set forth in claim 17 further comprising
2 the step of holding the constant pressure of the gas and plastic material in the
3 mold cavity for a predetermined amount of time before said first portion of the
4 plastic material is expelled back into the injection molding machine.

1 19. The process as set forth in claim 17 wherein a
2 predetermined amount of plastic material is expelled back into the injection
3 molding machine.

1 20. The process as set forth in claim 17 wherein the gas is
2 injected into the plastic material of a location at a distance from the nozzle of
3 the injection molding machine.

1 21. The process as set forth in claim 17 wherein said plastic
2 article has at least one section which is thicker than other sections and said
3 pressurized gas is introduced into the thicker section in order to form a hollow
4 portion therein.

1 22. The process as set forth in claim 17 further comprising
2 the step of also allowing a second portion of the plastic material in the mold to
3 be expelled into at least one secondary cavity coupled to the mold cavity.

1 23. The process as set forth in claim 22 further comprising
2 the step of also allowing a third portion of the plastic material in the mold to be
3 expelled into a second secondary cavity coupled to the mold cavity.

1 24. The process as set forth in claim 22 wherein the step of
2 allowing a second portion of the plastic material in the mold to be expelled into
3 at least one secondary cavity comprises opening a valve member in a conduit
4 connecting the mold cavity with the secondary cavity.

1 25. The process as set forth in claim 17 wherein the step of
2 allowing a first portion of the plastic material in the mold to be expelled back
3 into the barrel of the injection molding machine comprises opening a shut-off
4 valve member positioned between said mold cavity and said barrel.

1 26. The process as set forth in claim 25 wherein said valve
2 member is included as part of the nozzle.